

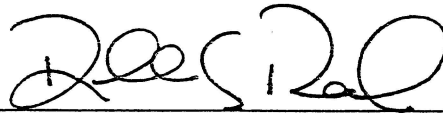
QUARTERLY PROGRESS REPORT

DRD 875MA-003

March 2002

**Marshall Space Flight Center
Safety and Mission Assurance Mission Services Contract
NAS8-00179**

Approved:

A handwritten signature in black ink, appearing to read 'R. S. Reed', is written over a horizontal line.

**Randall S. Reed, Program Manager
MSFC S&MA Mission Services**

April 12, 2002

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1.0 INTRODUCTION

Hernandez Engineering, Inc. (HEI) successfully performed all required activities and tasks, as described in this report, in fulfillment of their Safety and Mission Assurance (S&MA) Mission Services Contract (NAS8-00179) with NASA's Marshall Space Flight Center (MSFC). This report covers a three-month period of the contract's second quarter of the first option year: January 2002 through March 2002.

2.0 GENERAL MANAGEMENT

2.1 Data Requirements

The second quarter of the first option year of the S&MA Mission Services contract was successfully completed on March 31, 2002. All Data Requirements (DR) Documents were submitted on or ahead of schedule throughout the quarter. They included DRD 875CD-001 On-Site Employee Location Listing; DRD 875MA-002 Financial Management Reports; DRD 875MA-003 Progress Reports (Monthly/Quarterly); DRD 875MA-006 Operations Plan, Problem Assessment Center (PAC); RD 875MA-007 Quarterly Open Problems List; DRD 875MA-008 Monthly Newly Opened/Closed Problem Summary; DRD 875SA-002 Mishap and Safety Statistics Reports; and Quarterly Safety Performance Evaluation.

2.2 Personnel Status

(b) (4)

3.0 BUSINESS MANAGEMENT

We have experienced no financial or business management problems during this period. We attribute this to close attention to details, effective use of established controls designed to efficiently respond to program changes---both anticipated and unexpected---and the continuing support of our corporate financial group's dedicated efforts at controlling overhead expenses.

The contract continues to have a total cost underrun at the end of this period---see the March 2002 Monthly Financial Report, DRD 875MA-002, for specifics. Attachment 2, Man-Hours Expended, of this report contains a description, by major task, of the total man-hours expended this period. L (b) (4) J

4.0 PERFORMANCE OF WORK AND USE OF FACILITIES AND EQUIPMENT

4.1 Safety

4.1.1 Industrial Safety (IS)

The Industrial Safety (IS) group initiated the CY02 OSHA compliance annual facilities inspections, performed 100 OSHA compliance facility inspections and provided all required reports in a timely manner. Also, IS performed 503 construction site compliance inspections to

monitor adherence to OSHA and MSFC safety standards and performed verification checks of OSHA facility violations reported closed by Building Managers in numerous facilities. All facility safety violations were documented in the HAZTRAK databases in order to assure MSFC's compliance with OSHA, NASA, and other consensus code requirements.

Among other activities, IS: (1) updated five facility fire evacuation plans; (2) participated in four pre-construction conferences; (3) performed ten final safety inspections of facilities under renovation or construction; (4) reviewed 144 sets of facility design drawings for compliance with OSHA and consensus codes; (5) performed two fire drills; and, (6) prepared and presented one training class to employees who anticipate being a safety monitor for critical lifts.

In support of the MSFC initiative to become VPP Star Certified, IS continued to provide t (b) (4) to assist the VPP Communications and Implementation Teams, and general communication of safety awareness to all MSFC employees. (b) (4) and other IS team members included: (1) assisting QS01, the SHE/VPP Implementation, Organization Coordination, Steering, and Training Committees, (2) developed and published multiple PowerPoint presentations; (3) prepared several safety bulletins for use on the SHE web site; (4) drafted, published, reproduced, and distributed the weekly SHE Highlights; (5) participated in a one-day VPP fact finding visit to the OSHA area office and prepared a detail report of the visit, (6) prepared a summary of one-year VPP eligibility criteria requirements; and, (7) prepared and tabulated IHOPS information for the VPP Program Manager.

As a major significant effort, IS continued to provide extensive support to the planning and review activities associated with the planned new Propulsion Research Laboratory (PRL). Support included: (1) participation in the weekly meetings; (2) performing numerous safety assessments and facility inspections of current hazardous operations scheduled to be relocated in the PRL; (3) performed an extensive, manpower intensive safety review of the Jacobs Engineering/Sverdrup 90% Design package which included participation in the PRL requirements meetings with the MSFC PRL Project Team to discuss the review comments with the Jacobs/Sverdrup design team; and, (4) planning for the early April 100% design review at the Jacobs/Sverdrup Orlando, Florida office.

IS initiated, completed, or followed up on more than ten facility safety assessments (SA). Examples included: (1) completed the Operational Hazard Analysis (OHA) for the movement and transportation of the ISS S5 Short Spacer from a Marshall facility to Redstone Army Airfield for loading on the Super Guppy; (2) completed the SA for the Risk Reduction Program (RCS) TRW Thruster testing; (3) completed the SA for the 11- Inch Hybrid Motor; (4) performing a SA for the Micro Light Gas Gun in building 4612; (5) initiated a SA for the Gas Dynamic Mirror (GDM) Fusion Experiments; and, (6) initiated a SA for the Laser Ignition testing with Advanced Fuel System in building 4583.

As a significant strength, IS continued to provide (b) (4) to the MSFC Test areas. Examples of support included: (1) pre-test, post-test, and safety monitor duties for the 11-inch Hybrid Motor and the TRW LOX/LH2 Thruster; (2) supported the investigation of the Army Vortex test failure; (3) reviewed and approved numerous hazardous

operations test procedures; and, (4) provided daily support to test engineers and S&MA personnel on technical issues.

IS continued to support the implementation of the NASA lifting standard, NSS 1740.9 by providing day-to-day advice and assistance to S&MA customers. In addition to performing several OHA's, IS: (1) served as the S&MA safety monitor for the ISS S5 Short Spacer lifting and handling operations at MSFC; (2) participated in the preliminary pre-acceptance inspection for the Ringer Crane 747 in the East test area to include extensive discussions on safety issues regarding using a man lift basket to inspect the upper (excess of 140 feet) part of the boom; (3) developing an improved and detailed PowerPoint presentation course materials for Safety and Quality monitors of critical lifts for approval by the Safety Environmental and Health (SHE) Training Committee; and, (4) administered hands-on proficiency examinations to eight overhead-crane/hoist operators and one forklift operator in support of the MSFC Personnel Certification Program.

4.1.2 System Safety

System Safety reviewed and provided comments to the Space Shuttle Main Engine (SSME) Integrated Hazard Analysis (IHA) and United Space Alliance (USA) Solid Rocket Booster (SRB) element Hazard Analysis (HA). In addition, System Safety participated in the investigation of the Solid Rocket Booster (SRB) structure contamination, SRB hydraulic pump replaced inserts, SRB Ethylene Propylene Diene Monomer (EPDM) rubber debond, and Auxiliary Power Unit (APU) Integrated Electronic Assembly (IEA) controller card cracked diode issues. System Safety supported the Independent Operations Assessment Team (IOAT), the development of SSME Launch Commit Criteria (LCC) database, the SSME Launch Count Down Simulation, and the SSME Risk Assessment of transistor failures on engine health monitoring.

System Safety provided technical support for the following: Shuttle Safety Review Panels (SSRPs); SSRP face to face, STS-109 Preliminary Assessment Review (PAR), STS-109 Pre Flight Assessment (PFA), STS-109 Program Mission Management Team (PMMT) tag up, STS-110 PMMT tag up, STS-113 Element Assessment Review (EAR), STS-110 PFA, and provided launch support in the Huntsville Operations Support Center (HOSC) for STS-109.

System Safety continues to evaluate Unsatisfactory Condition Report (UCRs), and Problem Reports (PRs), as required to support the shuttle program, as well as reviewing changes for impacts to safety.

Payload Safety completed/initiated five (5) safety data packages (SDPs). The Node 2 Delta Phase II Flight, the UF-2 Multipurpose Logistics Module (MPLM)/Orbiter Reflight SDP, and the Biotechnology Carrier (Bic) Flight Phase III SDP were submitted to Johnson Space Center (JSC). In addition, the Microgravity Science Glovebox (MSG) Integrated Phase III Ground SDP and the Bic Reflight Phase III Ground SDP were submitted to Kennedy Space Center (KSC.) In addition to SDP development, Payload Safety continued development of three (3) SDP's and reviewed/submitted comments for three (3) SDPs.

Payload Safety supported the Flight Payload Safety Review Panel (PSRP) for Coarsening in Solid-Liquid Mixtures (CSLM)-II Phase III, Glovebox Integrated Microgravity Isolation

Technology (g-LIMIT) Delta Phase III, Towards Understanding Pore Formation and Mobility during Controlled Directional Solidification in a Microgravity Environment Investigation (PFMI) Delta Phase III, Solidification Using a Baffle in Sealed Ampoules (SUBSA) Delta Phase III, the Integration Status Review of the Belgian Taxi Flight Projects (for use in the MSG), and Carbon Dioxide Reduction Assembly (CRA) Technical Interchange Meeting (TIM). Payload Safety continues completion of the Propulsive Small Expendable Deployers Systems (ProSEDS) Missile System Prelaunch Safety Package (MSPSP). Payload Safety also generated ALTUS Cumulus Electrification Study (ACES) safety charts for incorporation into the Airworthiness Flight Safety Review Board (AFSRB) presentation. Payload Safety supported the Delta II Ground Operations Working Group (GOWG) and Mission Integration Working Group (MIWG) meetings at the Cape Canaveral Air Force Station (CCAFS) in support of ProSEDS. Payload Safety performed a Fault Tree Analysis (FTA) for TS-500 tubing contamination and Army Vortex tube test anomaly. Payload safety initiated a FTA for the Delta-L project.

System Safety participated in the following technical meetings: Co-Optimized Booster for Reusable Application (COBRA) Prototype Engine Valve and Actuator System Preliminary Design Review (PDR); COBRA power head PDR, COBRA Engine system Risk Reduction Review (RRR), COBRA Integrated Engine PDR; RS83 Engine Concept Design Review (CoDR); COBRA Internal Main Oxidizer Valve (MOV) Critical Design Review (CDR); COBRA Internal Discontinuously Reinforced Aluminum Review; COBRA Internal Rig Valve CDR; COBRA Hi-pressure Oxidizer Turbo Pump (HPOTP) & Hi-Pressure Fuel Turbo Pump (HPFTP) CDRs; COBRA Low-Pressure Oxidizer Turbo Pump (LPOTP) & Low-Pressure Fuel Turbo Pump (LPFTP) PDRs; Environment Control and Life Support System (ECLSS) Integrated Rack (IR) CDR; Enhance Gaseous Nitrogen Dewar (EGN) Flight Readiness Review (FRR) and Pre-ship review for PFMI/SUBSA; Pre-ship Review for g-LIMIT, Mechanics of Granular Materials (MGM) Acceptance review and MGM Pre-ship Review. Payload safety initiated a S&MA plan for Delta-L.

Payload Safety supported the generation of the MPLM Operations Book for use at the console. Payload Safety supported generation of safety requirements for Space Launch Initiative (SLI). In addition, Payload Safety attended the Advanced Electric Propulsion (AEP) technology Analysis meeting, the Orbital Debris Colloquium at Goddard Space Flight Center (GSFC), and the Advanced Space Transportation Program (ASTP) Technology definition workshop. Two Payload Safety Engineers have been attending Propulsion classes at University of Alabama, Huntsville (UAH).

4.2 Reliability

4.2.1 Reliability & Maintainability (R&M) Engineering

In support of Shuttle Projects, significant R&M activities included participation in the flight readiness and launch support activities for STS-109 and STS-110 as well as active participation in various anomaly resolution teams. SSME R&M also participated as a team member in the Pratt & Whitney consolidated audit team, and conducted interviews and audited several procedures related to non-conformance reporting and processing. R&M provided ongoing technical support to qualification

process of the upgraded Solid Rocket Booster Altitude Switch Assembly (ASA) and participated in the ASA Critical Design Review.

In support of the 2nd Generation Reusable Launch Vehicle program, R&M continued providing R&M discipline support to S&MA, including review of program documentation to ensure that R&M requirements are correctly specified. R&M also participated in the Third Generation Reusable Launch Vehicle Vision Vehicle workshop to provide input to the development of a vehicle requirements document.

In support of the International Space Station (ISS) Node 2 and 3, R&M has been extensively updating the Node 2 FMEA/CIL and submitting it to ISS R&M on a subsystem-by-subsystem basis. As part of this update, the Node 2 analysis has been compared to the baselined USL analysis to ensure consistency, previously unanalyzed hardware has been included, and all worksheets are being reviewed and concurred with by appropriate Node 2 subsystem engineers. During this period, FMEA/CIL worksheets for the Communications & Tracking subsystem, Electrical Power System, and Internal Thermal Control System were finalized and resubmitted to ISS R&M. In support of the Regenerative ECLSS Integrated Rack CDR, R&M prepared and submitted the FMEA/CIL, Limited Life Items List, and Maintainability Analysis deliverables for the Water Recovery System and Oxygen Generation System.

In support of Science & Payloads, R&M is in the process of updating for release the Solar-B FMEA to incorporate additional information received during the instrument CDRs and from the instrument subcontractors. In support of the MSRR-1 Integrated Payload Rack CDR, R&M prepared and submitted the MSRR integrated rack FMEA/CIL and Maintainability Analysis. R&M also prepared a Fault Tree Analysis for the Gravity Probe-B Gas Management Assembly (GMA) and coordinated it with the GP-B project and subcontractor.

4.2.2 Problem Assessment Center (PAC) Operations

HEI's PAC personnel processed and coordinated disposition of problem reports, supported launch milestones, coordinated the MSFC Problem Assessment System, and operated the Corrective Action System (CAS). The PAC received and entered 28 new problem reports (PRs) into MSFC's Problem Reporting and Corrective Action (PRACA) System, coordinated MSFC interim closure of 49 PRs, received 19 prime contractor closure recommendations, supported MSFC full closure of 18 PRs, coordinated non-problem closure of 2 problems, and performed 115 individual PR database updates and reviews. Also, conducted were 9 SSME problem review boards, dispositioning 38 of 38 problem reports presented. The PAC generated or updated trends for all SSME, RSRM, and SRB problems submitted as newly opened or for closure. Also, generated and distributed were monthly bubble trend risk charts for 1 and 5-year problem data, 12-month new problems moving averages for data over the last year, and age charts for currently active problems.

The PAC supported 10 pre-launch milestones for STS-109 and -110 in addition to coverage of the simulation and Level A countdowns and launch of STS-109. This included providing open problems listing and counts, real-time meeting support, and/or issue analysis on open MSFC PRACA critical problems. In support for the launch attempts, we extracted and provided copies of KSC PRACA problems as they were entered at KSC for MSFC S&MA review during Level

A countdown. Also, used a PAC-generated spreadsheet of all countdown problems from STS-72 (1996) through current and the Shuttle PRACA webPCASS data system to provide additional data regarding problems occurring and being discussed during Level A.

In problem system coordination, the PAC conducted 3 SRB Problem Assessment System (PAS) status reviews for the SRB Chief Engineer; provided regular interface, implementation advice, and status tracking regarding reportable problems (such as the damaged ET diffuser assembly and the RSRM wire-in-propellant issues); screened MSFC PRACA access requests; and participated in the PPIA of SpeedRing for SSME.

The PAC provided various problem data in support of NASA and MSFC analyses. Special activities included providing MSFC PRACA problem histories on SRB APU controller card diode cracking, listings of Alenia and Boeing Huntsville problems associated with Node 2, providing SSME turbopump debris data for an STS-110 flight issue, and performing various SSME data queries in support of SLI – including uncontained failures and heat exchanger bifurcation joint. We also supported SLI in researching and participating in discussions of two root cause isolation software packages (REASON and ProAct) and of the Shuttle Hazard Analysis Risk Program (SHARP) as a safety measure metric.

(PWS 6.3.3) In implementation and operation of the MSFC CAS, we received 73 potential CAS reports (including 29 Customer Feedbacks), screened 69 draft Recurrence Control Action Requests (RCARs), and initiated 3 new RCARs. We received 7 responses from laboratory points of contact with either disposition rationale or response extension requests. We coordinated Corrective Action Board review of 6 RCARs, resulting in full closure of 5 RCARs. We also provided open RCAR status reports and discussion at the ISO Implementation Team meeting, issued monthly RCAR status and delinquent response reports, and presented monthly metric charts of RCAR activities and statuses at the ISO Implementation Team. In addition, we researched and briefed S&MA MMS coordinators on ECLSS's continuous risk management preventive action implementation. Furthermore, we prepared charts covering CAS and Preventive Action activities and metrics for presentation at the MSFC Quality Council meeting.

4.2.3 ALERT Program

HEI's ALERT support included both regular and special activities as we coordinated MSFC ALERT processing. HEI received and distributed 23 ALERT announcements for MSFC review and obtained 357 responses from MSFC project, contractor, and laboratory contacts. One of the released ALERTs was an MSFC-initiated NASA advisory on Amphenol Connector Cables and nine of them were coordinated through S&MA management for quick release during the STS-109 and STS-110 mission preparation freezes. We participated in a GIDEP Management Meeting in Long Beach, CA and generated/submitted a paper and charts for presentation at the annual GIDEP Workshop in San Diego in May, 2002. We assisted various ALERT actionees in access and use of the MSFC ALERT system, including establishing an SLI ALERT response organization. We also updated and obtained Document Control Board approval of MWI 1280.5B, "MSFC ALERT Processing" to document use of the on-line database system.

4.3 Quality

Space Transportation

External Tank (ET) Quality Engineering (QE) participated in four problem investigations during this review period. The investigations included: a debond foam condition on the LO2 feedline; a nonconforming GO2 diffuser installed on a tank at MAF; intertank stringer foam damage on a tank at KSC as a result of the personnel access platform impacting the stringers; and discrepant primer on the thrust strut end fittings supplied by a Lockheed Martin vendor. Quality engineering also participated in determination of corrective actions resulting from the investigations. In addition, ET Quality Engineering prepared a one-page summary identifying the LH2 tank changes resulting from implementation of the SSME Block II engine cluster and participated in a TIM on the ET Gaseous Oxygen (GO2) vent valve seals.

Solid Rocket Booster (SRB) Quality Engineering participated in four Phase III Pyrotechnic hardware reviews: Booster Separation Motors (BSMs); Nose Cap Thruster; Range Safety Booster Destruct Linear Shaped Charge; and Frustum Separation Linear Shaped Charge. QE participated in a manufacturing process review of the Hydraulic Pump Program, at Parker Abex and in a NASA Quality Leadership Forum to develop QS9100 Supplemental Quality System Clauses which will be utilized by the Aerospace community.

Space Shuttle Main Engine (SSME) Quality Engineering continued to provide support for pre-test planning sessions, post-test data reviews and acceptance reviews associated with acceptance of flight engine assemblies and related components. Quality Engineering supported the Pratt & Whitney Consolidated Audit at the West Palm Beach Facility and the AXSYS/SPEEDRING Process-Product Integrity Assessment (PPIA) in Cullman, Alabama.

Reusable Solid Rocket Motor (RSRM) Quality Engineering was involved in two RSRM special issues and the closure of these issues. These included O-Ring resiliency issues and wire contamination in the propellant. RSRM Quality engineering also prepared a one-page summary for STS-109 on possible thrust imbalance CEI spec limit violations. QE also participated in RSRM FMEA/CIL training, and ensured Certificates of Qualification (COQ) data reports for both STS-109 and STS-110 were distributed and signed in a timely manner to support both launches.

Quality Engineering continued to support the Joint Group on Pollution Lead-Free Solder Project and the NASA Workmanship Technical Committee with the review and drafting of addendums to class 3 of J-STD-001C "Requirements for Soldered Electrical and Electronic Assemblies" to support NASA Requirements. Quality Engineering also supported QS20 in three failure investigations: Amphenol connector problem, Auxiliary Power Unit diode failure, and the purple plague issue with transistor 2N3019 failures.

Quality Engineering supported the Project Office in preparing the shipping of the X-38 Deorbit Propulsion Stage (DPS) Bolt Retractor System (BRS) hardware to JSC. QE supported the testing of the Metal Lined Composite Tank at the Structural Test Facility. QE participated in the investigation of the contamination found during the buildup of TS500. QE generated a flow

chart on how the Customer Agreement (CA) and Customer Supplied Product Arrangement (CSPA) should be prepared in relation to the testing of a Customer Supplied Product (CSP) in the test area.

Software Quality Assurance (SQA)

HEI SQA activities included support of the Material Science Research Rack-1 and GLAST Burst Monitor. SQA witnessed informal testing of the MSRR-1 Software in Phase A. SQA also reviewed, provided comments and participated in tabletop discussions of the MSRR-1 Detailed Software Design Specification and the Software Requirements Volume I and II. SQA provided support to GLAST Burst Monitor by preparing a Software Quality Assurance Plan. SQA participated in the Safety and Mission Assurance Core Strategy team and its presentation to S&MA management on how S&MA will "Partner with Our Customers." SQA instructed Next Gen Ion (NGI) project members and contractors in Continuous Risk Management (CRM) and attended "Design for Reliability" training and Capability Maturity Model (CMM) training.

ISO

Quality Engineering has continued to play a key role to ensuring the maintenance of ISO 9001 at MSFC during this time period. Efforts have dealt with continuing implementation of the ISO 9001: 2000 revision, maintenance of documentation, internal quality audits, and planning and support for the registrar audits, including follow-up and closure of corrective actions. Quality Engineering provided general ISO support, including documentation reviews and consulting support on internal audits, training, continual improvement, and other aspects of ISO 9001, to various MSFC Organizations. Quality Engineering participated in a NASA Agency Quality System Review at Stennis Space Center, and supported S&MA in a meeting with resident MSFC personnel to discuss their upcoming audit by the registrar.

Quality Engineering also performed an initial gap assessment of the MSFC management system against the AS 9100 Aerospace standard and began coordination with directives OPRs to finalize the assessment. The results of this assessment will be used in making a decision as to whether or not MSFC will pursue registration to AS 9100 in addition to the ISO 9001 registration.

Payloads

Quality Engineering participated in several payload milestone reviews; Mechanics of Granular Materials (MGM) Twin Double Locker Assembly (TDLA) Pre-Ship/Acceptance Review, Enhanced Gaseous Nitrogen Project Flight Readiness Review (FRR), Altus Cumulus Electrification Study Project Airworthiness Flight Safety Review (AFSRB), Single-Locker Thermal Enclosure System (STES) STS 110 Certification of Flight Readiness (CoFR), and the Solidification Using A Baffle In Sealed Ampoules (SUBSA) And Pore Formation and Mobility during Directional Solidification in a Microgravity Environment Investigation(PFMI) Pre-Ship Review.

Quality Engineering supported Microgravity Science payload in the review and generation of various Project related documents which included; the GLAST Burst Monitor (GBM) Project's Safety and Mission Assurance Plan, Observable Protein Crystal Growth Apparatus (OPCGA) Project's Quality Plan, Delta-L Project's SSP- 50432 Safety and Mission Assurance (S&MA)

Compliance Matrix, and a S&MA Independent Assessment of the SUBSA/PFMI Project's Acceptance Data Package.

Quality Engineering supported the Microgravity Science Glovebox (MSG) Project at KSC to work with Astrium quality to assist in the closeout of the S&MA RIDS that were documented at the MSG Acceptance Review held at Bremen, Germany.

Inspection and Test

HEI quality assurance provided expertise in all MSFC test areas to MSFC test engineers and contract support personnel. The plasma arc facility, Test Stand (TS) 116, TS 300, TS 500, and the hot gas test facility are examples of test areas supported by quality assurance. Test procedures and planning were reviewed to ensure proper quality and test requirements are met on a day-to-day basis. HEI Quality Assurance continued to perform receiving inspections and witnessing of assembly and testing for PCG, g-LIMIT, PCAM, MSG, VCD, ProSEDS, SAMS II, MSRR, X-37, X-38, SUBSA, PFMI, InSPACE, CSLM, MGM III, PCAM, and OGS.

Quality Assurance personnel also supported various projects at KSC during assembly, testing and integration of experiments in flight carriers.

4.4 Information Management (IM)

Information Management's application development activities during the quarter were numerous and innovative. The most significant activity was development of The Portal System (TPS) database and of the portion of TPS that provides for automated access requests and approvals for any S&MA application that requires login. The access request application also fulfills all IT Security requirements governing access requests. TPS provides for use of the IDS login for access to S&MA resources and use of a centralized userid and password for non-IDS users. Users will request access through a link that will be incorporated into the footer of every IM application. The footer information is database-driven through TPS as well. Also deployed within the standard footer is a link to the IM Support Request (IMSR) application. IM revised the existing IMSR application to incorporate customer feedback functionality and to modify the support request function. Use of this suite of applications will provide significantly improved access to S&MA resources and improved security provisions.

The Supervisors Safety Web Page (SSWP) application was revised to provide supervisors a view of personnel meeting attendance rates; to separate contractor and civil service metrics for meeting attendance and visit performance; and to incorporate a survey regarding the center's completion status for entering hazardous operation information in the Inventory of Hazardous Operations (IHOPs) application. A report was added to IHOPs to support a study regarding the number of personnel supporting hazardous operations, and functionality for adding multiple job hazard analyses and operating procedures was incorporated. IM developed and demonstrated to MSFC Procurement Office personnel the preliminary design of the S&MA Inc. application. An MS Access application was developed for use by QS50 personnel in documenting quarterly contractor review results; the application will be used to refine S&MA Inc. requirements prior to development as a web-based application. In other development activities, IM deployed a modified Flash application for use by all personnel in reporting a mishap; revised Haztrak to

associate findings with facilities work orders, streamlining the process; began development of a combined Safety Concerns Reporting System (SCRS) and Haztrak application; developed Building system input, update and search screens; and revised the SHE training course site to modify display and registration functionality.

IM supported evaluation of a product for potential use in developing a web-based Haztrak application. Support included attendance at meetings and teleconferences as well as evaluation of the product and of a support proposal. IM also coordinated preparation activities and submitted required documentation to obtain web site registration of S&MA sites. Registration activities included evaluation and modification of all sites to assure adherence to web site content guidelines, submission of export control documents, and submission of formal registration requests. IM also performed a required yearly review of security plans and incorporated changes to servers and applications to implement changes in S&MA's security policy. Encryption was forced on three S&MA servers and associated modifications were incorporated. IM modified several applications for adherence to Section 508 compliance guidelines per S&MA's 508 Compliance Retrofit Plan. IM supported investigation of the cause of a server failure and efforts to rebuild replacement servers. IM also compiled and submitted a quarterly report of S&MA personnel's required completion of the IT Security training module.

4.5 Human Exploration and Development of Space (HEDS) Assurance

IA performed ISSP and SSP assessments and evaluations in several areas and investigated/evaluated launch issues associated with the STS-109 and STS-110 missions. IA also attended MSFC ISSP and SSP element meetings and participated in weekly teleconferences with JSC and KSC IA personnel.

4.5.1 International Space Station (ISS) Independent Assurance

ISSP Evaluations/assessments performed during this period included: Evaluation of Boeing Huntsville Quality Records maintenance and control, Evaluation of a non-conforming part discovered on-orbit, Evaluation of MSRR Project compliance with SSP 50431, *Program Requirements for ISS Payloads*, Evaluations of ECLS Design Reviews, and Evaluation of the Internal Cooling System problems. IA also developed five new proposals for ISS evaluations and assessments that will be submitted for approval.

4.5.2 Space Shuttle Independent Assurance

IA completed two revisions to the report of the assessment of the Thiokol RSRM QA Program. IA proposed three evaluations/assessments that are pending approval by the JSC Independent Assurance Office. HEI IA also has developed three new proposals that will be transmitted to JSC for approval. IA personnel participated in a local meeting of the Shuttle Safety Review Panel.

STS-109 and STS-110 changes and issues evaluated included: SRB APU Controller Card Diode Failure, SRB Attach Strut Closeout Cover De-bond, SRB Electronics Cable Connector Problem, SRB APU Pump Bolt/Insert Problem, RSRM New O Ring Resiliency, RSRM Nozzle Bond Line Residual Stress, RSRM Loose Joint Pin Retainer Band, SSME LPOTP Nozzle Vane Cracking, SSME LOX Post Indications, ET and SSME Engineering Changes (First Flight and Critical Process Changes), ET Oxygen Feed Line Insulation Defect, ET Non-conforming Part (Diffuser Screen) installed in Flight Hardware, ET Intertank Stringer Foam Damage, SRB Hydraulic Pump

Port Cap Bolts, RSRM Segment Change-out, RSRM New Sling Lining Tool, SSME First Flight of a cluster of three Block II Engines, SSME HPFTP Vane Repair, SSME HPFTP Turbine Exit Diffuser Fracture, SSME HPFTP Turbine Blade Shot Peening Process, SSME HPFTP Inlet Contamination, and ET Hydrogen Vessel Changes.

4.6 Project Assurance

HEI Project Assurance (PA) personnel provided technical support and assessments of Space Shuttle flight readiness for Pre-launch Assessment S&MA reviews and the Center Director's Technical Issues Briefing for STS-109 and STS-110. HEI also provided support at the HOSC during the launch of STS-109, during the reporting period. PA supported the S&MA consoles from "Level A" through main engine cutoff. The initial launch attempt was delayed by one day due to cold weather. No major issues on the MSFC elements were worked during the countdown. HEI personnel provided project assurance support for the ET, SRB, SSME and RSRM S&MA Assurance Offices.

PA continues to provide extensive support for the space shuttle pyrotechnics program. During the period, PA supported aft separation bolt phase II and phase III reviews.

In support of QS20, PA represented S&MA at the SRB Automated Booster Acceptance and Checkout System (ABACS) Review Item Discrepancy (RID) review. PA participated in the RID discussions, which resulted in two actions taken by the SRB project office. One was editorial in nature and the second was to preface the presentation to the program to ensure the program understands that the proposed upgrades will not guarantee supportability to 2020 and that additional systems upgrades will be required. PA concurred with the recommendation put forth that the Preboard accept the dispositioning presented and proceed to ATP without presentation to the Board.

PA provided training to the SRB safety engineer and assisted in reviewing and providing comments to United Space Alliance (USA) on the immediate update submittal of and SRB hazard analysis report required to add a previously unidentified hazard cause to the report prior to the launch of STS-109. PA coordinated the review with other HEI/MSFC organizations and presented the documentation update to the SRB Project Level IV and III change control boards. This was a fast turnaround activity that was completed in two working days.

PA participated in the MMT SIM at the Huntsville Operations Support Center (HOSC) that was held on February 13 in preparation for the upcoming STS-109 launch. The countdown clock was started at approximately T-1 hour 30 minutes, and included numerous Launch Commit Criteria (LCC) violations and near violations. The simulation provided an excellent opportunity to verify efficient communication between all members of the launch support staff, and valuable practice in analyzing hardware issues using the various data sources.

PA participated in a technical interchange meeting (TIM) with the GP-B Gas Management Assembly (GMA) contractor Moog in Buffalo, NY. The primary subject of this TIM was with regard to weld cracks, which developed in a number of latch valves. The cause was identified and a process to repair the cracks was subsequently developed. PA also participated in a Safety

TIM held at Vandenberg Air Force Base (VAFB). Range Safety verbally accepted the latest version of a "working" copy of the GP-B Missile System Payload Safety Package (MSPSP), which will now go final. Interestingly, the NASA/KSC Resident Representative at VAFB stated during the TIM that the GP-B payload is the first payload ever to deliver their procedures to the Range before the due date. During this period PA accompanied Stanford University (SU) Quality Assurance to visit Advanced Micropolish Inc. (AMI) for the purpose of auditing their QA organization. AMI is building the Gas Delivery System cart for GP-B. Also, during this period PA participated in the quarterly Mission Integration/Ground Operations Working Group meetings held at SU. PA participated in each GP-B Monthly Stanford Progress Report meeting held during this report period.

Transition/Privatization

Transition to the SFOC is complete. The next phase of the process is now known as "Competitive Sourcing". This new strategy is explained in the new budget proposals and involves providing greater flexibility, avoiding cost growth and moving NASA from an operator of infrastructure to and purchaser of services. This new course is not yet defined so PA has become involved in the working groups that will be establishing the basis for Competitive Sourcing. These groups include the Quality Leadership Forum, Process Control Focus Group, Joint Audit Planning Committee and the Supplier Assessment System. Involvement at these levels will allow S&MA to have influence and insight into the direction of the shuttle program in the future.

4.7 Risk Management and Risk Assessment

4.7.1.1 Risk Management

Project Assurance (PA) coordinated a meeting with S&MA and Systems Management Office (SMO) personnel to review and evaluate software developed at JPL for Risk Management. This tool is a data base tool for tracking Continuous Risk Management (CRM) efforts and is very similar to the e-Port tool being developed by SMO. It was the consensus of the team that the JPL tool has some benefits and that SMO personnel will work with JPL to capture those features for inclusion in e-Port. Also discussed was a plan development template being developed at JPL that had been demonstrated to Mr. Stephenson. This tool, though impressive in overview, has not been completed for CRM. SMO will maintain contact with JPL to assure MSFC has knowledge of future developments. The most pressing CRM need is in the implementation and efforts will be primarily focused there.

During the period, HEI taught one full course in risk management and provided a Continuous Risk management overview to a procurement team. HEI continues to review and upgrade the presentation material and tailor it specifically to the needs of MSFC programs and projects.

4.7.2 Space Shuttle Probabilistic Risk Assessment (PRA)

During this reporting period, Risk Assessment (RA) continued to work on the Space Shuttle PRA project. RA met with the shuttle PRA Technical Lead and four of the MSFC Prime Contractors (Lockheed Martin, Pratt and Whitney, Rocketdyne and United Space Alliance) to discuss current PRA modeling techniques and status.

In addition to regular status checks with each of the MSFC Prime Contractors, RA focused on the following areas during this reporting period. On ET PRA, RA helped to bring the new ET PRA lead up to speed on ET PRA and, reviewed the final ET fault tree models. Also during this period, RA rearranged and reformatted the current ET PRA fault tree models to match the PRA technical advisor's quantification strategy. On SSME PRA, RA worked with Rocketdyne on the changes to the current PowerPoint documentation format to accommodate random, process and functional failure models. RA also created Crystal Ball software template for quantifying SSME Failure to MECO Fault Tree and SSME random failure Event Sequence Diagram. On SRB PRA, RA worked closely with SRB PRA Team Member on updating the PRA models with current flight data, and model re-quantification using QRAS software.

RA prepared and participated in the Shuttle PRA management TIM at MSFC. Topics discussed at the TIM included current PRA schedules, project and program office buy-in requirements, software issues and modeling status. Finally, RA also supported a MSFC Project Management briefing on PRA status and the buy-in process made by the MSFC and JSC PRA Leads.

4.7.3 Reliability Prediction & Risk Assessment

Risk Assessment (RA) and Reliability received appreciation from S&MA for assistance in assessing potential pocketing in STS-108 RSRM nozzles. RA had conducted data analysis exploring expected duration of pocketing events during testing and elucidated the concept of statistical tolerance bounds to S&MA and RSRM staff. RA also had performed data analysis exploring apparent change in ply angle in recent production, leading to further work by NASA investigating improvements to production methods.

RA participated in analyses of bad lots of SRB cable connectors, a flight issue. Input included confirming the problem's isolation to specific lots of a specific connector. An assessment was performed showing that cables not easily inspected on STS-109 without destacking presented very low risk. RA also verified results by USA determining risk due to defective inserts on hydraulic pumps.

ET asked RA to analyze data to determine capability of the nose cone graphite fiber carbonization process. RA found that the way specifications were built could be improved, that the process would benefit from optimization and that statistical process control would give better quality assurance. RA is presenting these findings to ET.

RA is working with SSME to construct a Block II demonstrated reliability model. RA determined the differences in assumptions used by MSFC and Rocketdyne and will reconcile these differences next quarter.

Work continues on RSRM nozzle. An erosion model is ready to present to the project; this will happen early next quarter. If this model is accepted, a trend analysis based on this is also ready. A char model will go through the same process.

In support of SRB, RA participated in completion of action items #1 and #2 from the SRB Independent Operations Assessment Team (IOAT), focusing on quality, reliability, and nonconformance evaluation. RA participated in Thermal Protection System and Deceleration Subsystem team telecons. The TPS sample size reduction work performed by RA was presented as an example for possible improvement in other areas.

RA actively participated in the S&MA key goals team concerning attainment of world-class status. This team made proposals leading to improving Marshall S&MA's capabilities and recognition of this by the S&MA community.

RA completed MSFC Quality Training for New S&MA Employees, an overview of general quality requirements. This included a good look at the new PBMA system.

Risk Assessment (RA) participated in a workshop designed to convey to each member of the S&MA Team an outline for a long-range strategic plan which will serve as a focal point for continuous improvement and customer service excellence in safety and mission assurance roles for MSFC and NASA. RA also participated in a Process-based Mission assurance – Knowledge Management System (PBMA-KMS) workshop intended to introduce to the members of S&MA to the implementation of a processed based management system which is intended to aid communicative and organizational efforts within NASA projects.

In support of the Space Launch Initiative (SLI) 2GRLV (Second Generation Reusable Launch Vehicle) program, RA gave input to circulating white paper drafts focusing on Reliability, Maintainability, and Supportability (RMS) products, milestone convergence, and RMS processes for the intended to be released in time for the Initial Architecture Technical Review (IATR). RA updated and submitted Space Shuttle scrub and on-pad abort data for circulation in the RMS working group community. RA, with the 2GRLV RMS team, reviewed RMS deliverables and decomposed each function into its components to obtain a comprehensive summary. RA also gave input in a discussion on issues relating to Root Cause Analyses relating to contractor Data Requirements Documents (DRD's) for Option 1, and coordination of RMS data.

During this period RA conducted numerous activities in support of the 2GRLV IATR program milestone. RA, along with other RMS team members, reviewed task definitions in preparation for the IATR. RA attended Lockheed Martin's Initial Architecture Review (IAR) (contractor IARs coincide with the NASA IATR milestone). The multi-day IAR covered Lockheed's 2GRLV architecture design, cost, trade space, etc. Lockheed Martin also presented the reasoning behind the down-selection of their vehicle architectures to those put forward to NASA in this review. RA attended a Pre-IAR of Orbital Sciences in cooperation with Northrop Grumman. The Pre-IAR gave a glimpse of the work-to-date by the corporations for 2GRLV.

In additional IATR support, RA participated with the rest of the 2GRLV RMS team in a weeklong 'war room' activity to put together a storyboard to be presented at the IATR. The storyboard envelops the RMS team's synopses on RMS data presented at the preceding Interim Architecture Reviews (IARs) held by Boeing and Lockheed Martin Corporation, as well as RMS data analyzed by the program's Inter-center Systems Analysis Team. RA also gave input in discussions on issues relating to the Boeing, Lockheed and Orbital Sciences IARs.

5.0 COST REDUCTION ITEMS

Our continuing cross-utilization of employees, continuous analysis of work in progress to assure that application of resources meets the needs of the task, and the judicious acquisition and distribution of tools to enhance the efficiency of all team members allow us to minimize cost to the customer.